Flare 8 Root Cause And Corrective Action Analysis Report – Consent Decree

April 19, 2021 through April 20, 2021

Provided below is information related to the discharge to the No. 8 Flare of SO_2 emissions in excess of 500 lbs in a 24-hour period in accordance with recordkeeping and reporting requirements specified in Condition 60 of the Consent Decree entered in United States, et al. v. HOVENSA, LLC, Civ. No. 1:11-cv-0006, for the following time period:

- *4/19/21 21:00 through 4/20/21 03:00*

This event occurred during a planned startup of the Delayed Coker Unit (DCU) in which the plant operators followed existing startup procedures for the affected equipment (coker wet gas compressor) as specified in the Flare Management Plan. Thus, while a root cause analysis is required for this incident by the Consent Decree, a root cause analysis and corrective action analysis is not required under NSPS Subpart Ja.

Summary of Incident:

On April 19, 2021 beginning at 16:00, the gas flow to the No. 8 Flare had a high concentration of hydrogen sulfide (H_2S). H_2S peaked at 40,000 ppm around April 20th between 00:00 - 01:00 hours. The H_2S was combusted to sulfur dioxide gas (SO_2) at the flare tip.

The incident coincided with the Delayed Coking Unit (DCU) startup activities. Feed was introduced to the coker heater H-8501B and Drum #4, and heated from 260°F to 900°F on April 19th at 15:00 hours, beginning the coking process. The coker wet gas compressor (CWGC) was started on April 20th at 02:40 hours. During this time off gas from the coking process was routed to the No.8 Flare.

a. The date and time the discharge was first identified and the duration of the discharge [Consent Decree Paragraph 60.a]

Operators first identified the issue when the CWGC would not startup on April 19, 2021 at 02:40 as the DCU was being charged. Off gas to the flare began on April 19, 2021 at 02:40 and ended on April 20, 2021 at 02:40, as the CWGC started up. The duration of the discharge was 24 hours.

b. The measured or calculated cumulative quantity of gas discharged over the discharge duration. Include measured H_2S, Total sulfur, SO_2, and flow rate as applicable and calculations used to determine the quantity of SO_2 that was emitted. [Consent Decree Paragraph 60.b]

Appendix 1 to this document includes the data recorded by the Data Acquisition and Handling System (DAHS) related to the continuous monitoring system located at No. 8 Flare.

SO_2 emissions are calculated using the concentration of H_2S as measured by the No. 8 Flare mass spectrometer and the total flow to the flare as shown in the following equation:

$$SO_2\left(\frac{lb}{hr}\right) = FR \times C_{H2S} \times 1.66 \times 10^{-7}$$

Where:

FR: average flow rate to No. 8 Flare during the incident, scfh, wet basis

C_{H2S}: the concentration of H_2S in ppmw as measured at Flare 8 mass spectrometer

1.66 x 10^{-7}: conversion factor $lbmole_{H2S}/385.3\ scf_{H2S}$▪$lbmole_{SO2}/lmbole_{H2S}$▪$64.066\ lb_{SO2}/lmbole_{SO2}$ ▪$[1x10^{-6}]$

c. The steps taken to limit the emissions during the discharge and the duration of the discharge. [Consent Decree Paragraph 60.c]

The refinery started the coking process with the intent to start the CWGC per procedure. When the CWGC failed to start, operations and maintenance began troubleshooting the cause, which was determined to be a motor safety interlock that was engaged due to a motor alarm. After the alarm was cleared, the CWGC motor was put into operation on April 20, 2021 at 02:40. The off-gas control valve to flare was closed immediately after the CWGC was started.

The total duration of the discharge to the flare was approximately 24 hours.

d. The root cause analysis and corrective action analysis including an identification of the affected facility, the date and duration of the discharge, a statement noting whether the discharge resulted from the same root cause(s) identified in a previous analysis and either a description of the recommended corrective action(s) or an explanation of why corrective action is not necessary. [Consent Decree Paragraph 60.d]

1. *H_2S and other sulfur species were released to No. 8 Flare from off-gas released from the DCU.*
2. *The release to atmosphere occurred at No. 8 Flare, an affected facility under NSPS, Subpart Ja.*
3. *The duration of the event was 24 hours as described in "b" and "c" above.*
4. *This discharge resulted from a similar root cause identified in a previous analysis on January 9, 2021 and on January 13, 2021.*
5. *The root cause analysis:*

Root Cause Analysis	*Corrective Action Analysis (or explanation that no corrective is necessary)*	*Status: completed within 45 days or schedule with proposed implementation and completion dates*
Existing CWGC procedures do not specify requirements to energize breakers or clear any existing alarms that may prevent CWGC startup.	*Modification of the CWGC Startup Procedures (Document #DCU-SU-164 and #DCU-SU-164a)*	*Completed within 45 days*
Operation of the CWGC was not initiated prior to pressuring the fractionization tower during the DCU startup.	*Perform an engineering evaluation of the startup procedure for the CWGC, to determine the feasibility of changing the startup sequence of the WGC to reduce flaring.*	*In progress Estimated Completion Date: July 30, 2021*

e. An analysis of the measures, if any, that are available to reduce the likelihood of a recurrence of the discharge resulting from the same root cause or significant contributing causes in the future. The analysis shall discuss all reasonable alternatives, if any, that are available, the probable effectiveness and cost of the alternatives, and whether an outside consultant should be retained to assist in the analysis. Possible design, operation and maintenance changes shall be evaluated. [Consent Decree Paragraph 60.e]

See response to "d" above.

f. For Acid Gas Flaring Incidents (not Hydrocarbon Flaring Incidents), specifically identify each of the grounds for stipulated penalties in paragraphs 63, 64 and 65 and describe whether the Incident falls under any of those grounds. [Consent Decree Paragraph 60.f]

This event was determined not to be an Acid Gas Flaring Incident.

g. For any corrective action analysis for which corrective actions are required, a description of the corrective action(s) completed within the first 45 days following the discharge and, for action(s) not already completed, a schedule for implementation, including proposed commencement and completion dates. [Consent Decree Paragraph 60.h for supplement report]

See response to "d" above.

h. If the analysis determines that corrective action is not required, the report shall explain the basis for that conclusion. [Consent Decree Paragraph 60.e]

See response to "d" above.

Appendix 1 – DAHS Records

Date/Time	VG_FLOWT (SCF) 001H	VG_FLOWT (SCF) 024H 1000000		VG_FLOWA (SCF) 001D 1500000		H2SPPMW (PPM)	SO2CDLBS_2 (LBS) 024H	SO2CDLBS_2 (LBS) 001H 500	
4/19/21 21:00	150,634.8	4,081,874.6	E			19,648.9	491.2	897.6	E
4/19/21 22:00	156,142.6	4,066,221.0	E			27,980.8	725.1	1,620.6	E
4/19/21 23:00	158,630.8	4,056,780.2	E			31,025.0	816.8	2,435.6	E
4/20/21 0:00	146,473.4	4,092,148.8	E	3,094,833.9		34,059.3	827.9	3,262.3	E
4/20/21 1:00	147,453.7	4,095,422.0	E			34,476.0	843.7	4,104.5	E
4/20/21 2:00	161,288.8	4,115,556.4	E			29,289.2	784.0	4,887.0	E
4/20/21 3:00	201,018.4	4,161,472.7	E			3,320.7	110.8	4,996.1	E